

ORIGINAL ARTICLE

A national census of ambulance response times to emergency calls in Ireland

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Abstract

Background—Equity of access to appropriate pre-hospital emergency care is a core principle underlying an effective ambulance service. Care must be provided within a timeframe in which it is likely to be effective. A national census of response times to emergency and urgent calls in statutory ambulance services in Ireland was undertaken to assess current service provision.

Methods—A prospective census of response times to all emergency and urgent calls was carried out in the nine ambulance services in the country over a period of one week. The times for call receipt, activation, arrival at and departure from scene and arrival at hospital were analysed. Crew type, location of call and distance from ambulance base were detailed. The type of incident leading to the call was recorded but no further clinical information was gathered.

Results—2426 emergency calls were received by the services during the week. Fourteen per cent took five minutes or longer to activate (range 5–33%). Thirty eight per cent of emergencies received a response within nine minutes (range 10–47%). Only 4.5% of emergency calls originating greater than five miles from an ambulance station were responded to within nine minutes (range 0–10%). Median patient care times for “on call” crews were three times longer than “on duty” crews.

Conclusion—Without prioritised use of available resources, inappropriately delayed responses to critical incidents will continue. Recommendations are made to improve the effectiveness of emergency medical service utilisation.

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Keywords: ambulances; response times; emergencies

Ireland has nine statutory ambulance services providing emergency, urgent and routine transport facilities to patients. The services are the responsibility of the eight individual health boards; in Dublin, the Eastern Health Board has an arrangement with Dublin Fire Brigade for the provision of emergency ambulance services. No single national body has responsibility for ambulance service monitoring or audit.

In 1993 the Department of Health’s Ambulance Services Review recommended the establishment of a National Ambulance Advisory Council.¹ The NAAC was established in 1995 and undertook a wide range of tasks related to

training, equipment, service quality and audit. Core principles underlying an effective, cost efficient ambulance service were identified, including:

- the equal right of all people to prompt and appropriate care
- the availability of care within a time period in which it is likely to be effective
- the provision of high quality clinical care through appropriate training and continuing education
- the need for flexible operational strategies to ensure that high quality care can be provided where and when it is most needed
- accountability for the quality and delivery of care
- cost effective use of resources
- maximum efficiency and quality of service with the resources allocated.²

As a first step in the implementation of these principles, baseline data on current activities by statutory ambulance services in Ireland were required.

Time is crucial in dealing with medical emergencies such as cardiac arrest, airway obstruction, severe haemorrhage or severe chest or head injury. These conditions account for many of hospital sudden deaths or deaths from trauma in Ireland.^{3,4} However, limited and sometimes unclear data are available on the impact of response times on morbidity or mortality. The 1996 UK Review of Ambulance Performance Standards carried out by the NHS Executive estimates that, within the UK:

- if 90% of life threatening calls were answered within eight minutes, an additional 300 000 patients would receive care within this critical period
- ambulance responses to 90% of cardiac arrests within eight minutes would result in an additional 3200 survivors, half of whom would be under the age of 70.⁵

In contrast, Jones *et al* reported that ambulance response and care times made no difference to mortality among victims of road traffic accidents.⁶ Snooks *et al* have shown that helicopter emergency responses have no impact on the speed of response or outcome for survivors, in comparison with land based systems.⁷

No data are available on current response times performance by Irish ambulance services. This research exercise was therefore commissioned and carried out in 1997 on behalf of the NAAC and Department of Health. The aims of the project were to provide a baseline response times profile and identify factors leading to delays in response time.

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Methods

A census of all emergency and urgent calls was carried out prospectively in each ambulance service for a one week period between February and April 1997. The data collection instrument was agreed between the research team and senior ambulance personnel. It was introduced to all controllers who would gather data at a training visit to the service one to two weeks before the census. The data included the control centre and station responding, the controller's description of the call as urban or rural, the timings of all calls, the distance involved, the crewing arrangements and limited information on the type of emergency. Data were gathered on emergency and urgent calls only. No other clinical information was available.

Census data collection was therefore carried out in a planned and consistent fashion throughout all control centres. The active support of all ambulance personnel is acknowledged and appreciated. While some variation in data recording is inevitable given the large number of ambulance personnel, controllers, systems and locations involved, we believe that data collection was sufficiently rigorous to allow effective analysis.

Ambulance crews are classified as "on duty" or "on call". On duty crews are available to respond to an ambulance call from either the ambulance base or ambulance vehicle at any time during their rostered shift. Crews defined as on call are called in from home or diverted from hospital wards to respond to an ambulance call.

Detailed structural, operational and personnel profiles of each service were collated using questionnaire data provided by chief ambulance officers and existing survey data available to the NAAC. This information is not reported here but is referred to briefly within the sections dealing with performance.

"Activation time" covers the period from receipt of the call to mobilisation of a fully crewed emergency ambulance. "Response time" covers the period from receipt of call to the arrival of the ambulance at the scene of the emergency. "Patient care time" refers to the time from arrival of an ambulance crew at the scene to arrival at hospital.

The activation and response times are listed under three time headings. Response times are based on elapsed times of 8, 14 and 26 minutes, as referred to in the Report of the Review Group on the Ambulance Services.¹ Most control centres use systems that record elapsed times in whole minutes; a record such as "eight minutes" may include elapsed times up to eight minutes and 59 seconds. Therefore, in this paper, "within nine minutes" indicates an elapsed time up to and including eight minutes and 59 seconds.

All data were compiled and analysed using Microsoft Excel.

Results

In all, 3436 calls were carried out by all services during the census; data on 3351 (97.5%) were available for analysis. The services identified the following:

- Emergency calls accounted for 2426 (72%) of the total, usually from the "999" telephone service.
- 925 (28%) were urgent calls, usually originating with a GP or request for inter-hospital transfer.
- Urban calls accounted for 2581 (77%), of which 2056 (80%) were emergency and 523 (20%) were urgent.
- Rural calls accounted for 746 (22%), of which 360 (48%) were emergency and 385 (52%) were urgent. (Thirty calls were not classified as either urban or rural.)
- Eighty five per cent (2056) of emergency calls originated in urban areas, 15% (360) in rural areas. (Ten emergency calls were not classified as either urban or rural.)
- Ninety two per cent of emergency calls (2232) were carried out by on duty ambulance crews and 8% (187) by on call crews. (Six emergency calls were not classified as either on duty or on call.)

ACTIVATION TIMES

Results are given as national averages with the range of results between different services.

Nationally 41% of calls had been activated within less than three minutes of receipt of the call (range 19–78%); 14% of calls took five minutes or longer to activate (range 5–46%).

Forty eight per cent of on duty calls and 30% of on call calls were activated at less than three minutes; 17% of on duty calls and 56% of on call calls took longer than five minutes to activate. In most services, structural or organisational factors were identified that contributed to slow activation times; examples included:

- the use of on call staff where at least one crew member must be called from home before activation occurs
- the use of on call hospital nursing staff as ambulance crew members: nurses are selected on the basis of availability, experience and/or training, but delays are inevitable when ward duties are being undertaken by the nurses selected
- control room systems that do not allow activation of a vehicle until all information has been taken from a caller
- artificial factors such as crews not notifying their control centre of activation until some time after mobilisation

RESPONSE TIMES

Of all emergency calls (72% of all calls received): 38% had received a response within nine minutes (range 10–47%). Forty three per cent of on duty calls and 11% of on call calls had received a response within this timeframe.

Of emergency calls in urban areas (85% of all emergency calls): 44% of calls received a response within nine minutes (range: 29%–69%). Eighty one per cent of calls had received a response within 15 minutes (range 57%–89%). Eighty three per cent of on duty calls and 55% of on call calls had received a response within this timeframe.

Of emergency calls in rural areas (15% of all emergency calls): 29% of calls received a response within nine minutes (range: 10%–

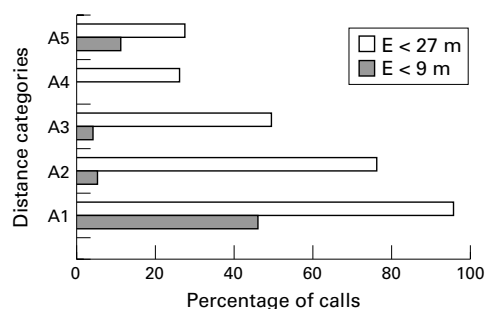


Figure 1 National response times for A1–A5 areas. A1: calls originating less than 5 miles from ambulance base; A2: calls originating 5–10 miles from ambulance base; A3: calls originating 10–15 miles from ambulance base; A4: calls originating 15–20 miles from ambulance base; A5: calls originating more than 20 miles from ambulance base. E < 27m: emergencies with response time less than 27 minutes; E < 9m: emergencies with response times less than 9 minutes.

37%). Fifty five per cent of calls had received a response within 27 minutes (range 35%–71%). Fifty nine per cent of on duty calls and 51% of on call calls had received a response within this timeframe.

Figure 1 relates response times to the distance of the incident from the ambulance base.

Within a five mile radius of an ambulance station, 46% of emergency calls had received a response within nine minutes of receipt of the call. Within a six to ten mile radius of the station, only 5% of calls had been responded to within nine minutes. Only 27% of emergencies more than 20 miles from the ambulance station had received a response within 27 minutes of receipt of the call.

Although no information on the process or outcome of clinical care was recorded in the study, the types of incidents were noted by the ambulance controllers at the command and control centres. Response times delays occurred in incidents involving collapse, cardiac arrest, cardiac (other), chest pain, road traffic accidents and accidents (other). The proportion of the above incidents responded to within nine minutes of receipt of call in the different services ranged from 26–53%.

Examples of factors identified in the organisational review that influenced response times performance include:

- geographical distribution of ambulance stations
- availability of crewed vehicles to respond
- distance and travelling conditions
- use of emergency ambulances for routine patient transfers

Table 1 summarises the range of activation and response times across the nine ambulance services, together with a national average.

Table 2 compares various timing bands for on duty and on call crewing arrangements and demonstrates that on duty arrangements consistently provide better performance.

PERIODS OF CARE

The periods of care during which crews provided care to patients were also identified. On duty crews provided patient care (arrival on scene to arrival in hospital) for a median period of 14 minutes; on call crews provided care for a median period of 41 minutes.

Table 1 Activation and response times—comparisons

	National average (%)	Range (%)
Activation		
E < 3 min	42	19–78
E > 5 min	14	5–46
Response		
E < 9 min	38	10–47
EU < 9 min	44	29–69
EU < 15 min	81	57–89
ER < 20 min	33	22–50
ER < 27 min	55	35–71

E = emergency calls, EU = emergency urban calls, ER = emergency rural calls.

Table 2 Comparison of timings by crewing arrangements

	On duty crews	On call crews
Activation < 3 min	48%	30%
Activation > 5 min	17%	56%
Median activation time	3 min	5 min
Response < 9 min	43%	11%
Response < 15 min	83%	55%
Median response time	9 min	20 min

Discussion

This study represents the first opportunity to nationally examine emergency ambulance responses in Ireland. The sample period of one week is short and may misrepresent activity in some areas. For example, extrapolation to an annual figure of the total numbers of emergencies seen in the North Eastern Health Board region is within 3% of the previous year's total. However, the number of emergencies responded to by the Western Health Board ambulance service is approximately 50% of that which might have been expected for other one week periods.

Within each service, a more detailed dataset has been assembled and made available to management. Great variations exist between and within services and this paper confines itself to issues that affect all or most of them.

More than 60% of emergency ambulance calls in Ireland did not receive a response within nine minutes. Both urban and rural emergencies have slow responses. Campbell *et al* report median activation times of 1.7 minutes and response times of 8.2 minutes for a US service; these figures indicate that Irish services have the potential to achieve faster responses.⁸

Those calls originating more than five miles away from the nearest ambulance station have a less than 5% likelihood of a response within eight minutes of the call.

A simplistic approach to these deficiencies might involve creating an ambulance base within five miles of every area of housing throughout the country. This is not economically, medically or logistically viable and cannot be recommended.

The alternative is to develop the procedures and policies needed to make best use of the considerable resources already available. A wide range of such recommendations have been made to the NAAC and individual services by the Steering Group for this project. These include:

1 Arbitrary response time targets are crude and probably ineffective as a sole means of

ensuring the most appropriate use of limited resources. Prioritised dispatching has been shown to be an effective strategy for use by ambulance services.⁹ A combination of target bands and qualitative assessment of cases (prioritised dispatch by qualified controllers) should be introduced to ensure that key emergencies receive an effective response. The suggested principles include:

- all emergency and urgent calls will receive an ambulance response;
- life threatening emergencies will receive care within a maximum of eight minutes of the call being received;
- non-life threatening emergencies will receive a response within 15 minutes;
- urgent calls will receive a response within 20 minutes in urban areas and 30 minutes in rural areas.

2 Work to define life threatening, non-life threatening and urgent problems, together with sensitive and prospective identifying procedures, should begin as soon as possible.

3 All emergency vehicles should be crewed by EMT (emergency medical technician) qualified ambulance personnel.

4 On call arrangements should be dispensed with.

5 A dedicated emergency service should be created within each ambulance service.

6 Response times monitoring should become a routine audit activity in each service. Data should be routinely compiled at national level to monitor trends.

7 Given that ambulance response times in some areas may exceed eight minutes, the use of first responders should be introduced for key life threatening emergencies. A pilot programme should be established exploring the use of trained lay first responders (such as those with appropriate CPR or first aid training) and professionals such as general practitioners, public health nurses or police. Irish GPs have been shown to be effectively involved in the provision of high standard emergency care, particularly in rural areas.^{10 11}

8 Services should examine common communication and procedural issues, particularly where vehicles from one service are operating within another's area.

9 Some ambulance stations have very low emergency care workloads; this can make adequate skills maintenance difficult for some personnel. Consideration should be given to rotation of personnel or other procedures that would enable better retention of skills.

10 Clinical audit of the process and outcome of care by the ambulance services is essential. The appointment of medical advisors and in service instructors will facilitate this but it is vital that a baseline review of clinical care be carried out, similar to that undertaken for response times.

Significant investments of funds, personnel and commitment by staff and management will be required to implement recommendations such as these but the outcome will be a service of considerably higher quality, efficacy and cost efficiency.

Conclusion

All emergency calls do not elicit or merit a rapid response. This study has shown wide variations in both activation and response times throughout the country, independent of potential clinical need. Unless some form of prioritisation occurs, the current situation of inappropriately rapid responses to minor incidents and inappropriately delayed responses to critical incidents will continue.

An ambulance response to a critical incident requires a suitably equipped vehicle with appropriately trained personnel, dispatched immediately and arriving at the patients side in time to carry out any lifesaving interventions required.

A situation in which a patient with a life threatening problem has to wait longer because emergency ambulances are engaged in routine non-urgent patient transport must be tackled urgently.

A prerequisite of these developments is the establishment of centralised ambulance control centres with dedicated personnel, trained in dispatch and control procedures. There should be no place in this system for the use of hospital switchboards as control and dispatch centres for emergency ambulances. Nor can any justification be made for using staff untrained in emergency medical procedures to logistically prop up the service.

Current evidence suggests that improvements in response times, allied to effective delivery of immediate care, are a strongly cost effective use of resources, comparing well with other forms of healthcare intervention such as breast and cervical cancer screening and non-emergency forms of intervention for coronary heart disease.⁵

Setting high standards for rapid response times, implementing priority-based dispatch, and training and equipping an optimal number of personnel to deliver these services, have significant cost implications. There is, however, the potential for significant health gain, both in terms of lives saved and life years gained from reductions in premature death.

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Conflicts of interest: none.

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